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Supervisor Expression of Interest MSCA - Marie Skłodowska Curie Action - (PF) Postdoctoral Fellowship 2024

Supervisor name: Francesco Ferrise

Email address: francesco.ferrise@polimi.it

Link “Pagina docente”: <http://ferrise.faculty.polimi.it>

Department Name: Department of Mechanical Engineering

Research topic: Human digital twins

MSCA-PF Research Area Panels:

- ECO_Economic Sciences
- X ENG_Information Science and Engineering
- ENV_Environmental and Geosciences
- LIF_Life Sciences
- MAT_Mathematics
- PHY_Physics
- SOC_Social Sciences and Humanities
- CHE_Chemistry

Brief description of the Department and Research Group (including URL if applicable):

The research group, belonging to the Department of Mechanical Engineering, is named "Methods and Tools for Product Design". The group comprises 16 professors and around 20 among PhD students and post-docs. The group fosters a multidisciplinary approach. Prof. Francesco Ferrise, a full professor at the group, conducts research on the use of virtual and augmented reality technologies in various application fields, including, but not limited to, the industrial one. From the virtualization of products to improve their design, Prof. Ferrise began to study human behavior in interaction with products. He is the author of over 120 publications in scientific journals or international conferences; he is also Associate Editor of IEEE Computer Graphics and Applications, ASME Journal of Computing and Information Science in Engineering (JCISE), and Frontiers in Computer Science. He is a member of the scientific committee of the leading international conferences on Virtual and Augmented Reality, including IEEE VR and IEEE ISMAR. The research group coordinates three laboratories on the use of virtual and augmented reality technologies. Prof. Ferrise is the scientific coordinator of one of the three laboratories. This laboratory includes technologies to study human interaction with virtual products/services.



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TITLE of the project: Behavioral models for human digital twins

Brief project description:

The principle of Industry 5.0 affirms the centrality of the human being in the industrial work context. Recognizing the complexity and importance of human involvement, it's imperative to consider the entirety of the human experience when designing the roles of workers, as well as the tools and methodologies they use.

With the rapid advancement of technology, which can sometimes be perceived as a threat to human employment, it's crucial to develop systems that augment rather than replace human workers. This entails considering the technical skills required and the broader set of skills necessary to leverage emerging technologies effectively.

Involving humans extensively in the design process is essential. This engagement allows designers to observe human behavior in real-world contexts and refine solutions accordingly. However, due to economic constraints, exhaustive prototyping and user studies may not always be feasible.

While simulations of human behavior exist, such as virtual mannequins for ergonomic assessments, they often oversimplify human complexity. Addressing this challenge is a primary focus of the proposed research. By developing more nuanced models akin to product digital twins, we aim to enable systems to adapt to and support individuals effectively in their work roles.

The research will start with identifying key aspects of human behavior in interactions with products and services. Through prototyping solutions using eXtended Reality technologies, data across various experimentation phases will be collected. This data will inform the creation and validation of behavioral models, forming the foundation of a human digital twin.

Ultimately, the proposal aims to develop systems that optimize human performance and foster a symbiotic relationship between humans and technology, ensuring their continued relevance and contribution to the evolving work landscape.